RECORDS OF THE PAST

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PREHISTORIC IRRIGATION IN THE NAVAHO DESERT

IT has not been established that irrigation in anything more than a very rudimentary form was generally practiced by the aboriginal inhabitants of the arid sections of our Southwest prior to the Spanish invasion. The practice of impounding the drainage of small catchment basins in natural depressions and artificial ponds by the construction of dams of earth and stone was common wherever the Pueblo mode of life prevailed, but in only a few localities have remains been found that point to anything like a *system* or irrigation. That a well-developed system existed in the Gila drainage has been fully established. The remains of canals of great extent in the Gila and Salado valleys, capable of irrigating a vast area, have been described by Hodge,* and extensive works in the Verde Valley were described by Mindeleff.† These observations have the support of such eminent authorities as Cushing and Bandelier. These remains have rapidly disappeared with the advance of agriculture in recent years, but the observations mentioned, made while the remains were in a fair state of preservation, leave no question as to the existence and great extent of these works, while their prehistoric character seems to be equally well established. In these valleys the waters of the rivers were taken out

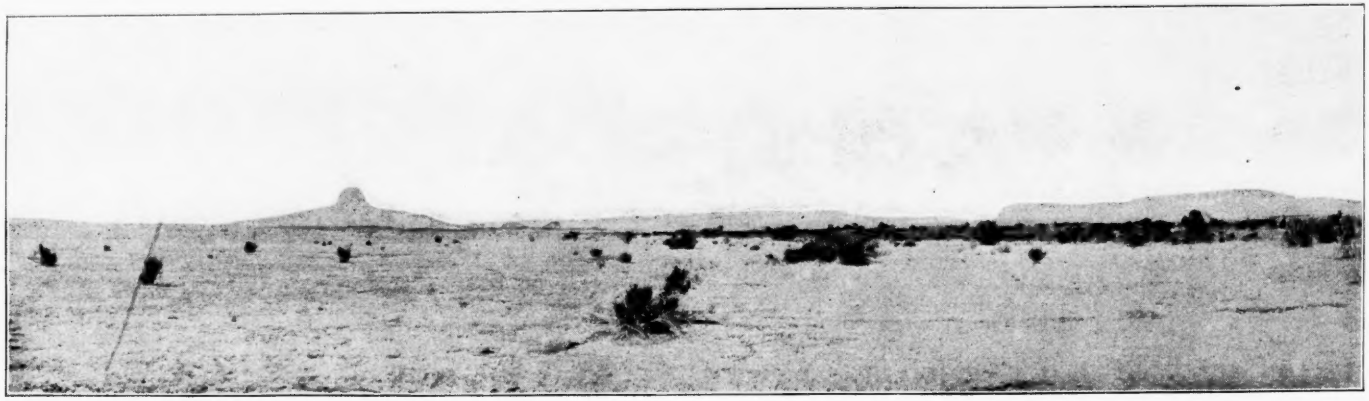
* *Prehistoric Irrigation in Arizona*, by F. W. Hodge; *American Anthropologist*, July, 1893.
† *Aboriginal Remains in the Verde Valley, Arizona*, by Cosmos Mindeleff, *13th Ann. Rep. Bur. of Amer. Ethnology.*

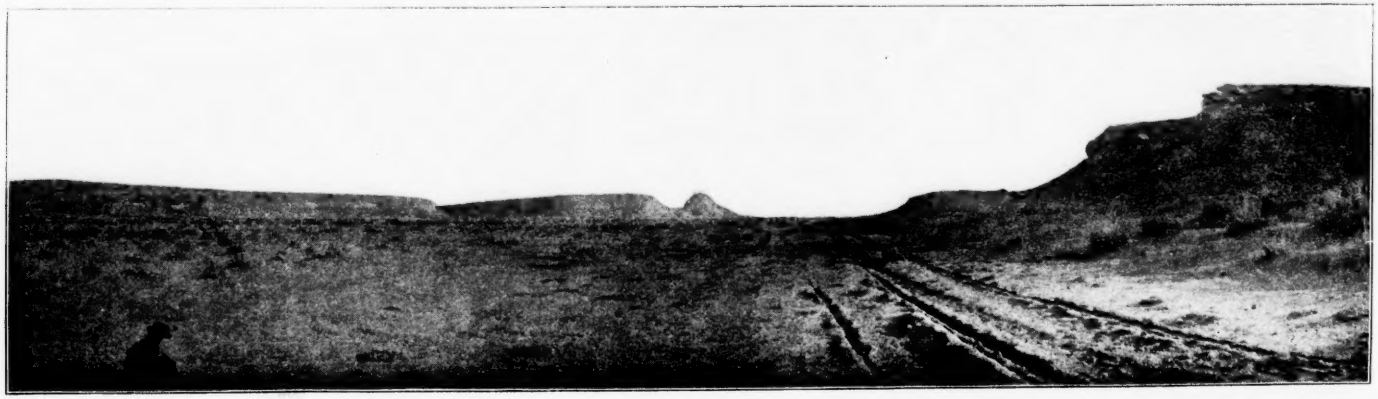
through well built canals, conducted for many miles and distributed by means of laterals over large areas. No higher development of the science of irrigation was reached in prehistoric America, and, indeed, it is doubtful if any people of the Old World practiced irrigation on a larger scale or by a more perfect system as early as the XV Century.

It seems certain, however, that no such system existed anywhere within the present limits of the United States outside of the Gila drainage. In the Rio Grande Valley only the most rudimentary form of irrigation was practiced. Small reservoirs are found in conjunction with almost every pueblo ruin. These evidently served to impound the waters of flood seasons for domestic use, and also for the purpose of watering small fields, but at best they could have served only slightly to supplement the natural rainfall. In places small ditches are found extending from the mountain sides into the valleys evidently designed to divert the waters of mountain torrents to irrigable fields. I know of none of these of any considerable extent save one at Puye on the Pajarito plateau in New Mexico. Here a large, well constructed ditch, originating in a catchment basin of considerable area, west of Puye Mesa, is carried along the hillside a few feet above the bed of the dry Puye arroyo for a distance of over two miles to the level plain east of the ancient village site. It cannot be established, however, that this is work of the prehistoric period. It is well known that the Puye pueblo and cliff village was reoccupied by the Santa Clara Indians late in the XVII Century, after having been long abandoned, and after the Spanish system of irrigation had been introduced among the Rio Grande Pueblos.

Irrigation was perhaps equally developed in the Little Colorado drainage in pre-Spanish times and may have reached a somewhat higher plane in the San Juan Valley. The remains of rather extensive works have been reported from time to time in the latter region, but these have for the most part been destroyed in recent years.

A totally unlooked for development of irrigation works was observed by the writer in the midst of the Navaho Desert in northwestern New Mexico while on a brief reconnoissance of the ruins of Chaco Canyon and its environs. The character of this desert may best be observed by entering it from the eastern side by the way of Jemez. It may be entered more easily from the northwest by way of Farmington or from the southwest by way of Gallup or Thoreau. Entering by way of Jemez, the last stream of any consequence that is crossed is the Puerco, and this is by no means permanent. At the Torreon, a few miles further west, water is retained in holes during the greater part of the year. Beyond this, vegetation quickly disappears and absolute desert is encountered. For the next hundred miles or so, a more barren waste cannot be pictured by the imagination. There are vast stretches where no living objects, not even the ordinary desert plants, are to be found. A loaded wagon sinks half hub deep in the grayish-yellow sand, the wheels leaving great furrows which, however, are filled by the wind





NAVAHO DESERT SCENES

within a few minutes, leaving the trail completely obliterated. The horizon line is usually relieved by long elevations of table-land, or abrupt, isolated buttes which loom up in the clear atmosphere, forming sometimes the only landmark for an entire day's travel. There are places where the entire horizon is unbroken, where there is not a tree, bush, hummock, undulation or mark of any sort, where the wind immediately obliterates all tracks and the traveler must steer by the compass.

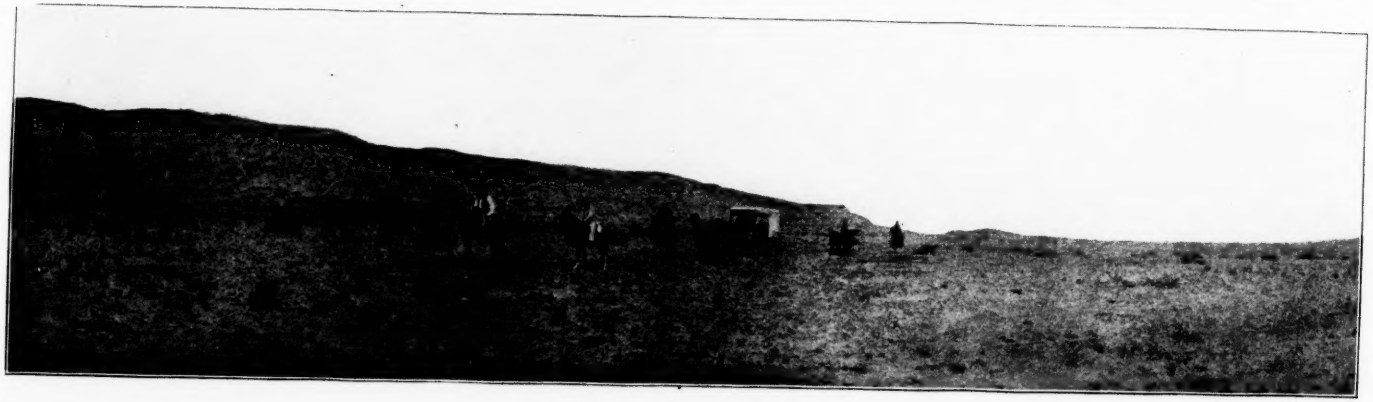
In the midst of the appalling waste, about 90 miles northwest of Jemez, is the famous Chaco Canyon group of ruins. They extend for a distance of about 30 miles along the dry wash of the Chaco and form the most imposing group of ruins in the Pueblo region. Not all the large ruins of the group are in the narrow valley of the Chaco, nor on the mesas immediately overlooking it. Several of the most important lie in the desert some miles to the south of the Chaco and it is about these that ancient irrigation works are most conspicuous.

The best preserved works in the canyon are at Una Vida, two miles above Pueblo Bonito, and those belonging to the pueblo of Penasco Blanco, three miles below Bonito. Near Una Vida, which is situated against the north wall of the canyon, a reservoir and system of ditches is discernible. Penasco Blanco is situated on top of the mesa south of the canyon. Its fields lay in the bottom north of the Pueblo. No great area was cultivated and it is difficult to understand now how such a sea of land could ever have produced sustenance for such a large community. The reservoir was built in a bed of sand where seepage would naturally have been so great as to render it useless. This was overcome, at least partially, by lining the bottom with clay and slabs of stone. This clay when indurated formed a moderately good cement and rendered the reservoir fairly effective. The waters from the main channel of the Chaco were diverted by means of a weir and conducted to the reservoir. Seepage in the weir was overcome by the same method as in the reservoir.

Kinklizhin is a large ruin on the mesa between 7 and 8 miles southwest of Pueblo Bonito. Here are fairly well preserved irrigation works. The pueblo stands on a sandy hill. About ⅛ mile away is a broad wash and in this are well preserved remains of a stone dam. On the east side is a waste-way cut through the solid rock. The reservoir was large enough to impound a meager supply of water for the irrigation of the fields cultivated by the pueblo. These consisted of about 200 acres. The ditch which conducted the water from the reservoir to the fields is quite filled with sand but plainly discernible.

The best example of irrigation works in the entire Chaco system is that at Kinbineola This ruin is about 15 miles southwest of Pueblo Bonito. The ruin is in the basin of a wash of the same name which is tributary to Chaco Canyon. The valley is here quite broad and on the eastern side is limited by a low mesa, at the base of which stand the

RUINS OF KINBINEOLA (THE HOUSE OF THE WINDS)



NAVAHO DESERT SCENES

ruins of the pueblo. The wash is about ⅓ mile to the west. South of the ruins is a large natural depression, which was made to serve as a reservoir for the flood waters diverted from the wash. A ditch fully two miles long conducted the water from this lake to the fields, which were quite extensive. The ditch is carried around the mesa and along a series of sand hills on a fairly uniform grade. The ditch was mainly earthwork, but whenever necessary the lower border was reinforced with retaining walls of stone, portions of which still remain in place.

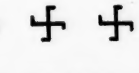
I am informed that at Kinyaah, a small ruin 40 miles south of Chaco Canyon, there are vestiges of an irrigation system. This ruin is situated on an open plain, surrounded by a large area of irrigable land. The works consist of two large reservoirs and a large canal 25 ft. to 30 ft. wide and in places 3 ft. or 4 ft. deep.

The observations above reported do not constitute an attempt at a complete description of irrigation as practiced by the inhabitants of the Chaco Canyon group of pueblos.

These are some of the results of mere casual reconnoissance. They are put down here to point out the existence of a system of prehistoric irrigation in the midst of the Navaho Desert that is intermediate in its plane of development between the advanced system of the Gila drainage and the very rudimentary form common to the entire pueblo region. It represents but modest achievement as compared with that of the Gila people, but marked advance over the common achievements of the prehistoric pueblos.

EDGAR L. HEWETT.

SMITHSONIAN INSTITUTION, WASHINGTON, D. C.



ARCHAEOLOGICAL NOTES FROM SWEDEN

THE physical geography of Skäne, the southern province of Sweden, is almost identical with that of Denmark and originally it belonged to Denmark. Nowhere does the land rise more than a few hundred feet above the sea and much of it is below 200 ft. It is entirely covered with glacial deposits and much of it with distinct moraine accumulations, in the midst of which bogs and kettle holes abound. Many of the summits of the low hills are surmounted by mounds or tumuli from 20 to 50 ft. in height. These mark the burial places of the ancient Vikings. Some of them have been excavated and found to contain, in addition to the human bones, stone and bronze implements, showing that they belonged to the closing period of the Bronze Age. It is known that at a later time the tribes practiced cremation; but these burials took place before that period. From all these considerations it is reasonably inferred that the mounds date back about 4,000 years.

The Museum at Stockholm is second only in interest to that in Copenhagen and has been brought to its present high position under the direction of Mr. B. E. Hildebrand and his son, Dr. H. H. Hildebrand. It is interesting to note that these eminent authorities discard the old terms "palæolithic" and "neolithic" as being without proper significance, both the chipped and polished implements being evidently used contemporaneously. Dr. Hildebrand, while granting that all the implements found in Sweden are post-glacial, still has evidence which satisfies him that many of them are at least 4,000 years old.

RAISED BEACH AT SÖLVESBORG, SWEDEN

The most interesting and recent archæological discoveries are those which have been made at Malmö, in southern Sweden, just across from Copenhagen. Here is a well marked raised beach about 20 ft. above the present reach of the waves. This forms one of the evidences of the post-glacial elevation of the land in southern Sweden. As one proceeds northward he finds these raised beaches at higher and higher levels until they attain an elevation of about 800 ft. At Sölvesborg, about 100 miles northeast of Malmö, is to be found one of the most excellent examples of these raised beaches, the old sea level at this point having been in post-glacial times 187 ft. higher than at the present time. The beach at Sölvesborg consists of immense accumulations of well rounded pebbles which were gathered by the waves in a recess in the mountain side, which formed a bay at that elevation. All the sand

has been washed away and the pebbles were well sorted in size and in places arranged in a series of level topped terraces. These pebbles range from an inch or two to a foot in diameter.

The raised beach at Malmö, however, consists of the smaller pebples stratified with gravel and sand. Near the surface of the Malmö raised beach many stone implements and pieces of pottery occur over a considerable space which shows marks of fire. The situation is very much like that which Dr. Gilbert has described at one place in the old raised beach south of Lake Ontario. The Crown Prince of Sweden has interested himself much in the excavations of this mound, but has reserved a considerable section for future exploration.

Most important of all, however, are the implements which Dr. N. O. Holst of the Swedish Geological Survey has found at the base of this beach at Malmö, showing that man was in southern Sweden prior to the commencement of this elevation of the land, thus giving us another connection between prehistoric man and the great earth movements which have taken place in post-glacial time. As yet we have no satisfactory means of determining the rate at which the land has risen in the Scandinavian peninsula, and it may have varied greatly at different times, many things indicating that it was more rapid in the earlier period than in the later, while the rate at the north was much more rapid than at the south end.

The implements found by Dr. Holst are preserved in the Museum at Stockholm. They all belong to what was formerly called the palæolithic type, resembling in shape, though not in material, those found by Dr. Abbott at Trenton, New Jersey.

Of great interest, though of much later date, are some ingots of gold recently secured by the Museum at Stockholm, weighing several pounds, and also a long, heavy spiral of gold, several pounds in weight. These specimens were not found in burial places where explorations had been made, but accidentally in cultivating the fields. Probably they were treasures which had been hidden away for protection. Payments were made by cutting off from the ring a quantity of gold valued at the sum required. There were also several collars and necklaces of gold with ingenious arrangements for fastening. Altogether these ornaments and treasures of gold give one a remarkable impression of the barbaric splendor of prehistoric times in Scandinavia.

The archæologists of Denmark were the first to recognize the proper succession of the stone, the bronze and the iron age of prehistoric man. This was natural, since it is here that the distinction between these ages is most closely seen. Fittingly, therefore, the National Museum of Copenhagen has preserved the relics of these ages more fully than any other museum. Under the courteous attention of the distinguished director, Dr. Sophus Müller, I have been able to see these abundant relics in the Museum and in the field. Both because of their resemblances to and differences from our American relics, it seems important to make record of my notes.

Denmark is but a congeries of terminal moraines, nowhere rising more than 200 or 300 ft. above the sea. Everywhere the land is strewn with Norwegian boulders, except where they have been gathered into heaps, built in stone walls or built up into substantial structures. So similar are the results of the glacial period wherever it has prevailed that one might, anywhere in Denmark, imagine himself in the lower peninsula of Michigan or in southern Wisconsin or Minnesota. Moraine hills and kettle holes are everywhere mingled in indescribable confusion. The most of the kettle holes are filled with peat bogs, but many of them remain as small lakes. Here, indeed, in this well watered and heavily forested country was an ideal place for primitive man.

STONE IMPLEMENTS FROM TRENTON, N. J., IN MUSEUM AT COPENHAGEN

The stone implements in the Museum very closely resemble the rough stone axes and discs found in the mounds of the Mississippi Valley, though the material is different. In the extensive chalk formations underlying Denmark, prehistoric man had access to any amount of flint nodules, which were easily chipped into desirable forms. The abundance of these in the Museum at Copenhagen is perfectly over-

whelming. But, while there is here properly a superabundance of local material, there are also representative specimens from every other locality. It was certainly gratifying to find all our states represented by their characteristic "indian implements." I was specially pleased to see specimens of the argillite palæoliths from the glacial gravels of Trenton, New Jersey.

But like the relics of the mound builders of the Mississippi Valley, the implements of the stone age in Denmark are all post-glacial. The Kitchen Midden (kitchen refuse) near Fredrickswerke, in Zealand, which we were able to visit, is on the shoreward side of a terminal moraine, about 20 ft. above sea level. The sea is now about a mile distant, that amount of flat land having been laid bare by the rise of the shore which has taken place in post-glacial times. The Kitchen Middens were originally formed at a height of not more than 3 ft. above the sea.

The most of the shells in the heap were very small, though there were some of the oyster of moderate size. In this respect the heap differs greatly from the celebrated one at Damariscotta, Maine, where the oyster shells are of immense size and have accumulated to a much greater extent than here. This heap is about 100 ft. long and 7 ft. thick. But how much of it may have been worked away, or how far it extends into the bank cannot be told.

Other relics of prehistoric people also abound. Many of the glacial hills all over Zealand are capped by conical mounds, like those in the Ohio Valley, to mark the burial places of the Vikings, who ruled in this region not later than 4,000 years ago. Two of these mounds, in a dense forest, we passed on our way to the Kitchen Midden. They were about 30 ft. in height and 200 ft. in breadth, but have never been explored. A Dolmen, also, was visited on the way. This consisted of several huge granitic boulders split in the middle and set up on edge, so as to make an enclosure about 8 ft, in diameter, while over all was a huge granite slab 10 ft. in length and 3 ft. thick. It is a puzzling problem to tell how the great mass was elevated to its present height and balanced so carefully upon the edges of the upturned circle of boulders which form the enclosure. Similar enclosures I have seen in the waste portions of Japan and in Siberia and in Great Britain; but so far as I know none are found in America. They are among the relics of the earliest prehistoric races who succeeded to palæolithic man, and are certainly very impressive indicators of his mechanical skill and ability and strikingly illustrate the wide gap separating even the earliest men from the inferior animal creation.

GEORGE FREDERICK WRIGHT.

COPENHAGEN, DENMARK, *Sept. 7, 1905.*

KOURGAN ZARSKIE, CRIMEA, RUSSIA

THE ANTIQUITIES OF THE CRIMEA AT KERTSCH

FAR too little attention has been given to the early spread of Greek civilization around the Black Sea and the Sea of Azoff. A long chapter might be written concerning the search by the Greeks for the "Golden Fleece" in the streams which come down from the Caucasus at the eastern end of the Black Sea. An important article will soon appear in our pages from an archæologist of high local authority upon the recently discovered ruins of a Greek city founded near the mouth of the Don in 650 B. C. But in the present article we will limit ourselves to the antique remains found at Kertsch.

It must have been an exciting time indeed to the early Greek mariners when, after turning from the Black Sea up the narrow passage leading to the Sea of Azoff, they came to the broad expanse of that beautiful body of water. The situation is closely identical to that of the Bosphorus, which has given occasion for the growth of Constantinople. Here, two or three miles below the outlet of the sea, there is a quiet bay, setting into the Crimea on the west, admirably adapted for a harbor. Back of it there rises a low mountain, about 400 ft. in height, presenting an aspect something like that found at Athens with its temple-crowned Acropolis. This is Kertsch. As one sails into the port at the present time he cannot fail to be struck by the resemblance between these two historic centers of Greek influence. Through the enterprise of wealthy citizens, more than 100 years ago, a small temple,

in excellent imitation of the Parthenon, was erected upon the summit, which is named Mithradates Mountain, after the great hero who so long resisted Roman aggressions in Central Asia and extended his victorious arms far around the northern shore of the Black Sea.

Upon making closer investigation one's interest is greatly increased by examining the results of the explorations which have been carried on in recent times by Russian archæologists. The old Greek city, which was near the northeastern summit of Mithradates Mountain, has been partially excavated, showing extensive remains of a high Greek civilization dating as far back as 400 B. C. These remains

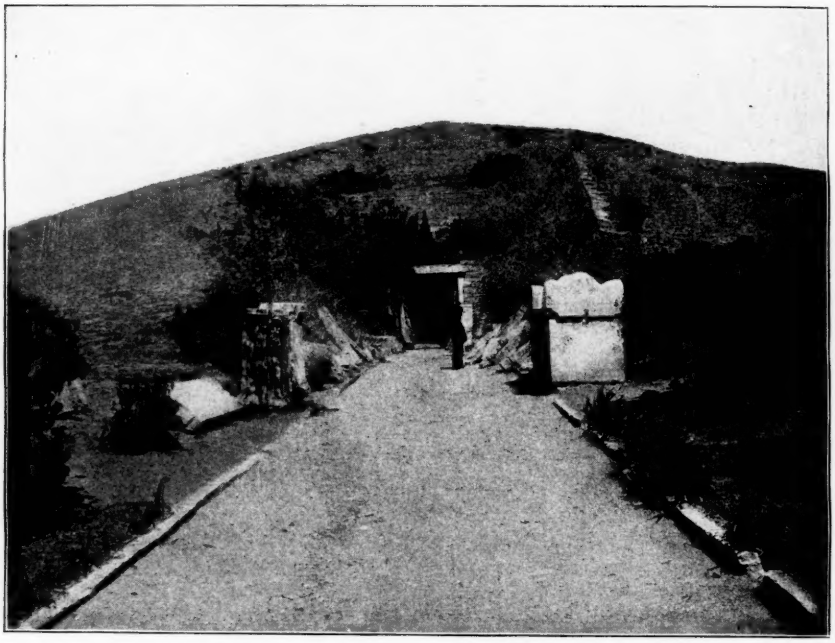
FRESCOE IN KOURGAN AT KERTSCH

are now covered by 25 or 30 ft. of debris which has accumulated through the occupation of this site by later and less civilized people. Innumerable mussel shells, mingled with rude pottery, would indicate that this later accumulation is similar to that of the Kitchen Middens in Denmark.

But the Greek remains show a high degree of refinement and of advance in practical arts. The numerous wells, in one of which the water is still standing at a great depth, show the independence of the fortress of an outside water supply. A large number of extensive excavations, suitable for holding stores of grain, have also been un-

covered, together with baths, an altar for votive offerings and places for public assembly. There was also an extended system of drainage, with some of the sewer pipes still in working order, and in one place lead pipe for conveying water.

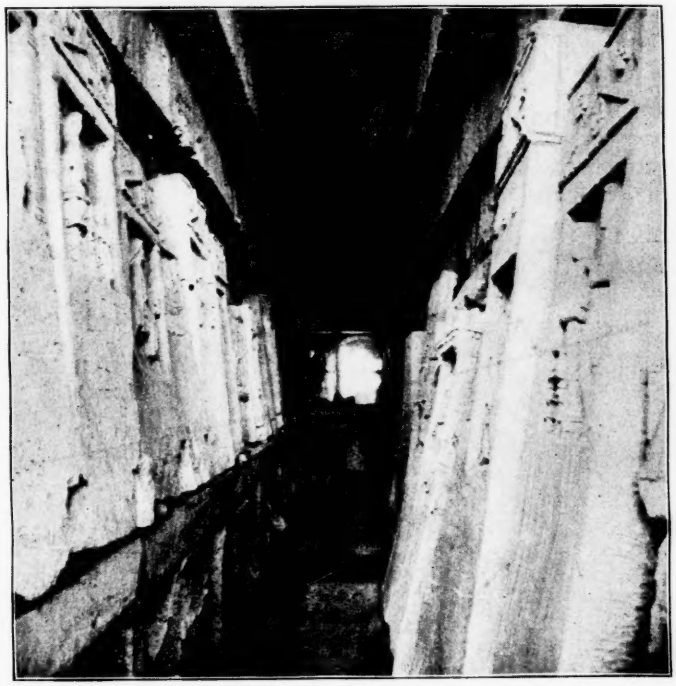
The archæological interests, however, are by no means all centered in the ruins of the city itself. Almost every hilltop in the vicinity is surmounted by a kourgan or burial mound. These are often 30 to 50 ft. in height and much resemble the Miamisburg Mound near Dayton, Ohio, and the Grave Creek Mound near Wheeling, West Virginia, though these two are higher than any which we observed in southern Russia.



ENTRANCE TO THE KOURGAN AT KERTSCH

The excavation of the Grave Creek Mound (if I remember aright) disclosed a rude vault, constructed of logs, in which some prominent chief had been buried. The kourgans, which have been excavated in the Crimea, also contain vaults, but of much more elaborate construction. One in the near vicinity of Kertsch, excavated under the direction of Alexander III, disclosed an elaborate stone structure about 15 ft. high, 10 ft. wide and 30 ft. long, ending in a square chamber roofed by a dome constructed of solid blocks of stone. The roof to the entrance was built up to a sharp angle by successive layers of stone projecting over each other. The appearance of the entrance is almost exactly like that of the so-called Agamemnon's Treasury at Mycenæ.

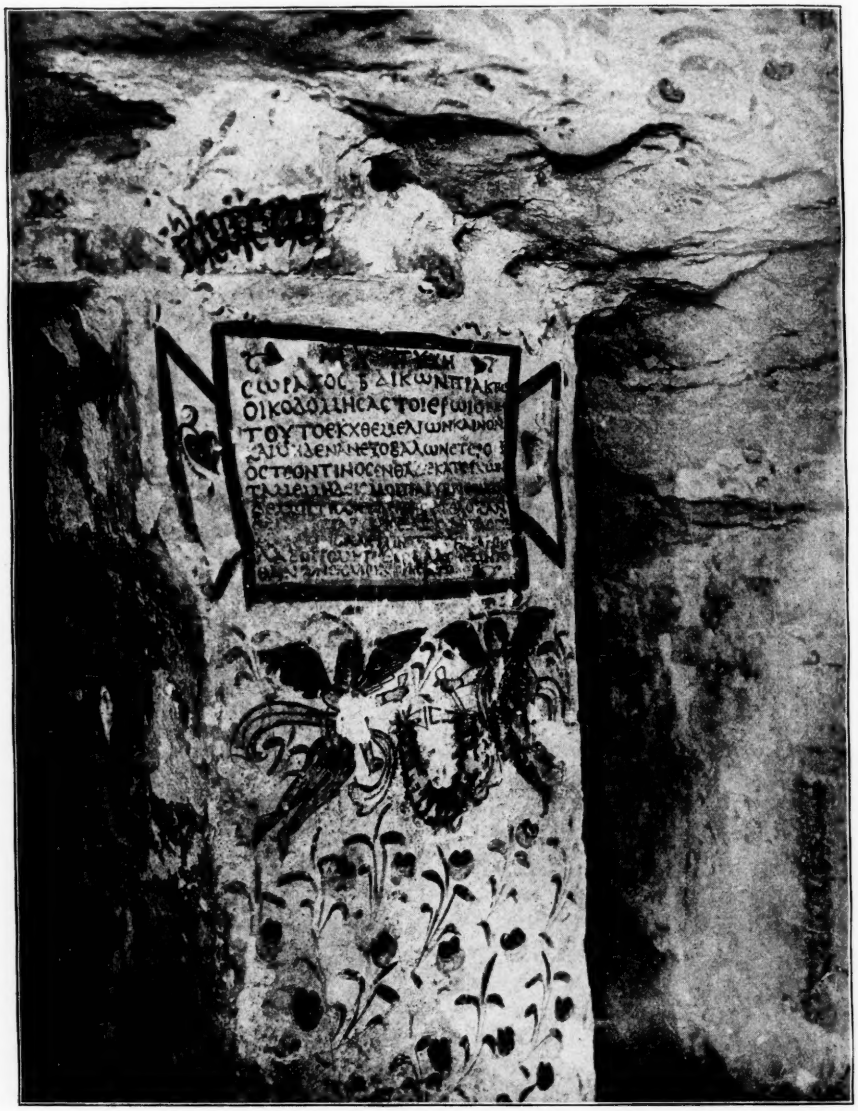
Two or three miles east of the city a kourgan of large size has recently been excavated. The diameter at the base is about 400 ft. and the height of the summit about 50 ft. The entrance to it is 117 ft. long and about 20 ft. in height, and, like the other, is covered by a roof of stone rising to a sharp angle, giving it also the external appearance of Agamemnon's Treasury. In this case the hall-way opens into a circular room 20 ft. in diameter. About 12 ft. above the floor the walls of cut stone begin to draw in, ending in a sharp cone about 30 ft. above the floor. The effect is very remarkable, and the whole structure involves a very high degree of mechanical skill and in-



INTERIOR VIEW OF THE KOURGAN AT KERTSCH

genuity. The kourgan is really a buried mausoleum, the cone of earth simply covering the elaborate structure constituting the tomb.

From the remains found in this kourgan it is shown to have been built about 400 B. C.; but, unfortunately, during the Roman occupation of the region, an opening was made from above, and its treasures of art were pillaged. This vandalism has added greatly to the difficulty of excavation, and deprived the world of much valuable information. But with wise foresight the Russian archæologists have taken pains to preserve what was left and to enrich the rooms of these acces-

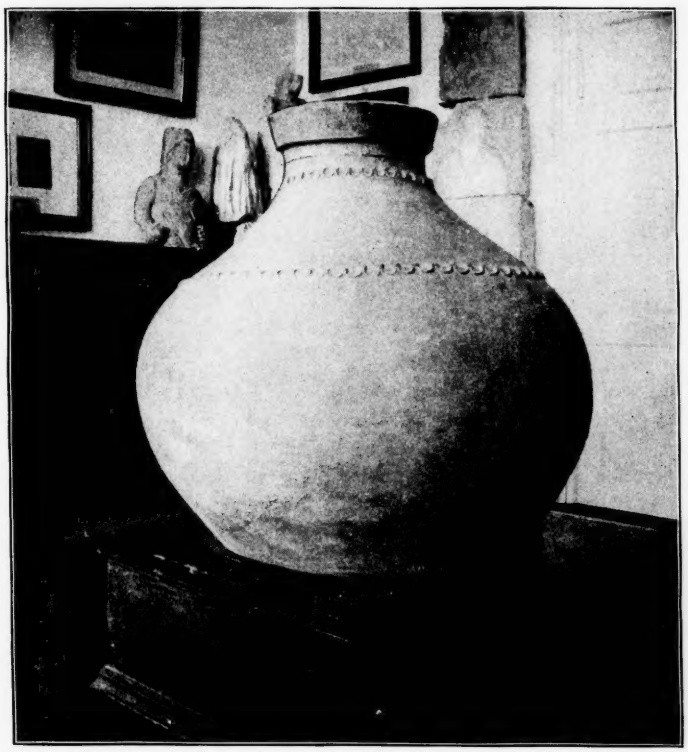


FRESCOE IN THE KOURGAN AT KERTSCH

sible tombs with treasures found in other kourgans of similar structure. These are now under the care of curators and are thrown open to the public, making them museums in themselves.

While the most valuable treasures found in these kourgans have been taken to the Hermitage in St. Petersburg, forming the celebrated

Kertsch collection, a goodly number have been collected in a local museum in that city, under the direction and care of Dr. Vladislav Vereslabbavoff Ulkarpel, a most competent and enthusiastic student of archæology. Among the treasures of this collection are a head of Demeter, a torso of Nike with exquisite drapery, and a number of classic heads of great beauty. Several clearly cut inscriptions, with a great number of vases of terra-cotta and black, show a high sense of beauty both in form and proportion. Besides these there are almost numberless specimens of irridescent glass tear-bottles, pitchers, bowls, and one large shallow dish. But what is rarest of all is a specimen of glass, which has been so preserved that neither moisture nor earth nor



IMMENSE WINE JAR IN MUSEUM AT KERTSCH

air had touched it, leaving it in its original condition, a plain green glass, showing beyond question that all the exquisite beauty of coloring is certainly due to chemical changes.

The curator had his man bring in for our inspection a cedar coffin lid, which has only recently come to light, showing in its ornamentation that they understood wood carving as well. The Greek ladies in

that far off colony were not above adorning themselves, as numbers of bead necklaces, gold ear ornaments, rings of gold and ivory and hair ornaments would testify.

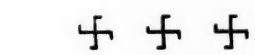
In addition, the curator showed us colored drawings which were copied from the frescoes of some of the kourgans which we had not seen. A great hole in the side of one roof showed where a Roman or some later vandal had tried to force an entrance.

Standing near the entrance of the museum is an immense wine jar, fully 5 ft. across in its widest part, causing one to wonder at the size of their kilns, and saying plainly that then as now this country must have grown numberless vineyards.

That such a civilization should have spread so early over this region, and continued so long as it did, even up to the IV or V Century of our era, and then become so completely extinct, being now buried beneath dirt and refuse of more than a thousand years of semi-barbarism, gives a gloomy picture of human history. Wendell Phillips would find here material for another lecture on the "Lost Arts," illustrating his theory that all ancient civilizations perished because of "man's inhumanity to man," for it appears that while Greece carried into this region with her works of art, wine and skins, the principal commodity which she received in barter was human slaves.

GEORGE FREDERICK WRIGHT.

ROSTOV-ON-THE-DON, *September 30, 1905.*



THE STOKE-POGIS BOWL

THE bowl shown in the accompanying illustration was found on "Stoke-Pogis," the estate of Frederick Phillips, in Lower Merion Township, Montgomery County, Pennsylvania. It was discovered by some workmen, who were digging pits in which to plant evergreens. The excavations, as near as I can now recall, were made from 2 to 2½ ft. deep. The men dug through a loamy top soil, then through a strata of lightish-blue clay, until they struck a blue-black gravelly deposit at the bottom of the pit, where the bowl was found standing on end. Evidences of decayed matter in the bottom of the hole indicate that the ground may have been originally marshy. The spot from which it was taken is within a dozen yards of a small stream—the head-water of the Aromink Creek—and at this point the banks are about 18 in. above the plane of the stream. There is a slight ascending grade—about 12 in.—from the water course to the spot where the stone was found.

The bowl is oblong in shape, but irregular in outline; it has 2 protuberances over its upper ends, to serve for handling it conven-

iently; its full length over these is 11½ in. The bowl proper is 9 in. long, 5½ in. wide and 3½ in. deep, outer dimensions. The inner part of the bowl measures 7 in., 4 in. and 3 in.

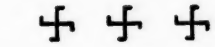
Within 100 yds. from the place where the bowl was found there was an outcropping of serpentine stone, from which the ground was stripped and a quarry operated for a year or two.

Two miles below, the Schuylkill River bisects a ridge of soapstone. Here quarries were established; and these have been worked intermittently for over 100 years.

The general character of the rock in the hills of "Stoke-Pogis" is mica-schist, horn-blende and bastard granite, as local terms go. There are, too, great quantities of detached boulders of immense size in the ravines leading to the Schuylkill.

SAMUEL GORDON SMYTH.

THE STOKE-POGIS BOWL



THE NEW ENGLISH EGYPTOLOGICAL SOCIETY

PROFESSOR PETRIE and a committee of over 40 persons of eminence have organized a society for conducting scientific explorations in Egypt. On the roll are men of fame in academic, civic and business life, with Sir John Lubbock as President, who is also President of the Society of Antiquaries. Dr. Petrie will now devote his energies and time entirely to *The Egyptian Research Account,* as the society is named. Some 11 years ago he started a society for instructing stundents in archæological work *in situ* and called it The Egyptian Research Account, but it was his personal affair, and of late years it has languished for want of support and because Petrie was devoting his time in Egypt to the Egypt Exploration Fund. It is thought best to retain the title in the new organization. But an object of the research will be to train students going to Egypt in scientific excavation.

The headquarters and office of the Society will be at University College, Gower St., London, W. C. where Petrie holds the Amelia B. Edwards chair of Egyptology, and where the official work will be done

by the Honorary Secretaries, Dr. G. H. Walker and Mrs. Hilda F. Petrie. From Dr. Walker I have a cordial letter expressing his belief that the many American admirers of the splendid work of Petrie will be glad to aid him in prosecuting his researches in Egypt. I am sure this is true, and that others caring to have truly scientific explorations in Egypt will subscribe. The significant statement is made that no expense is incurred for management or for office and Petrie's economy is quite as proverbial as his skill. The annual volume, fully illustrated, describing the explorations, will be sent to each subscriber of a guinea and upward. I have subscribed $25.00 and I will gladly receive subscriptions of $5.00 and upwards and forward them to Dr. Walker, who will return a receipt for the same. But I quote from the circular issued by the Society:

> In view of recent changes it is now intended that the Research Account should not only assist students, but should step into the wider field of providing also for the excavations of Prof. Flinders Petrie. The means of support for his studies in Egypt, during the last few years, having lately been diverted to other work, the continuance of his researches will now depend entirely upon the contributions to the Research Account. His excavations have led to the discoveries of the prehistoric age of Egypt, and the systematic knowledge of its development, the history and civilization of early dynasties, the scientific accuracy of the great pyramids, the Semetic worship in Sinai, the earliest monumental record of the Israelites, and their later connection with Tahpanhes; besides opening up the main sources of papyri in the Fayum and Oxyrhynkhos, and the series of Græco-Roman portraits. The rise of civilization in the Mediterranean has also been revealed, each age in advance of the results of explorations in Greek lands, with which they have afterwards been linked. Naukratis and Daphnæ, the Mykenæan art at Tell el Amarna, the Kamares pottery of XII Dynasty, the earliest painted Greek pottery of the I Dynasty, and the western pottery of the prehistoric period, are the framework which has made possible a scheme of European history before the classical times. To carry on this course of discoveries, which have become the basis of our present view of early history, and to continue to train students in such historical research is the purpose of the present movement.

For nearly 20 years I have labored earnestly and successfully in promoting explorations in Egypt, giving voice and pen to the cause in all ways and all directions possible. Tens of thousands of dollars passed through my hands, and papyri, and monumental objects of historical value have come to our museums. I know much of what has been done and of what remains to be done in Egypt; and I heartily commend the Research to American support until we have our own distinctively American Society, and we cannot do better than support Petrie in his labors attended with magnificent results.

WILLIAM COPLEY WINSLOW.

525 BEACON STREET, BOSTON, MASS..

BOOK REVIEWS

THE RATIONAL ALMANAC*

FEW realize what a veritable record of antiquity is found in the almanac. One of the most difficult of all the attainments of the human mind, has been the determination of the exact length of the year; while upon that determination has depended the whole progress of civilization. To savage tribes, with whom seedtime and harvest is immaterial, it matters little that the exact period of the earth's revolution about the sun remains unknown. But as soon as men begin to plant and sow seed, to multiply flocks and herds, it becomes a matter of the greatest importance to know just when the sun crosses the equinoctial line in the spring, in order that the seed may be put into the ground at the proper times as calendared from that point. Especially is this the case in Egypt and other countries where two, and sometimes three, crops can be raised each year if the planting of one kind is begun at the proper time to favor the requisite succession, since the variation of even a few days in the harvesting of one crop might push the others so far forward that the conditions would be unfavorable for their maturing.

If the revolution of the earth around the sun occupied an exact number of days it would have been comparatively easy to have determined by observation the exact length of the year; but, as the period is 365 days, 5 hours, 48 minutes and 49.62 seconds, it is a matter of extreme difficulty to determine it and to adjust our calendar to it. As it is, we have to insert a day every fourth year and to omit leap year every one hundredth year except on the four hundredth. It is interesting to notice that Julius Cæsar, who adjusted the calendar in his time, inserted the extra day of leap year near the vernal equinox, namely, between March 24 and March 25, which is a more natural time than mid-winter for the beginning of the year.

The simplest and one of the earliest modes of determining the length of the year was by setting up a row of stakes or monuments pointing due east toward the place of the sun's rising when the days and nights are equal. But this would naturally divide the year into periods of 6 months each, since there is an autumnal as well as a vernal equinox. There are many indications that at one time the period denominated a year was that between the equinoxes, and therefore was merely of 6 months' duration. Mr. Cotsworth's quick eye has enabled him to discern innumerable monuments adapted to this method of de-

The Rational Almanac: Tracing the evolution of modern almanacs from ancient ideas of time and suggesting improvements. By Moses B. Cotsworth, of York, Eng. 180 Illustrations explaining the Mystery of the Pyramids, Sphinx, Obelisks, Druidical Circles, Mounds, Vertical Stones etc., etc. Erected to record yearly Almanac Times.

termining the year. Stonehenge, for instance, is so constructed that on the longest day of the year (the summer solstice) the earliest sun's rays pass over the top of the "Friar's Heel" to the altar stone in the center of the circle. Many other adjustments of the stones to purposes of determining the season of the year are also found in this remarkable monument of Druidical art.

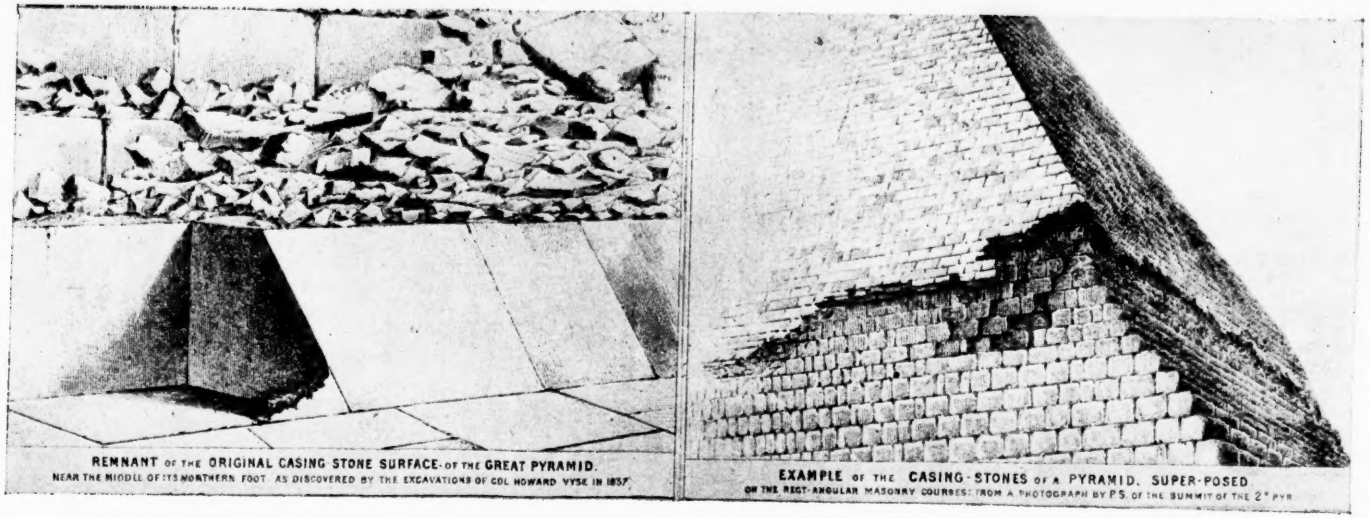
It is interesting to observe that even Julius Cæsar bears testimony to the attention given by the Druids to astronomical matters. "They discuss," he says, "many points concerning the heavenly bodies and their motions, the extent of the universe, and the world, the nature of things, the influence and ability of the immortal Gods; and they instruct the youth in those things."

Various astronomical instruments are also found among the Druidical remains adapted to determining the times of the movement of the different heavenly bodies. Even the breast-plate worn by the arch-Druid of Stonehenge was so arranged as to serve the purpose of an almanac.

Innumerable other arrangements for determining the length of the year by the time and place of the sun's rising are found among the monuments and relics of almost every nation. With some it was an opening in a wall into which the rising sun would shine on a particular day of the year; with others, as in the Sphinx, it was its alignment with the rising of the equinoctial sun over the Mokattam hills several miles to the eastward, across the Nile valley.

But the most accurate method was by observing noonday shadows. After long experimentation, our author found that the most perfect shadow for observation is that cast by a pyramid at the time of the equinox. The reason for choosing the equinox rather than the winter solstice, when the shadow is much longer, is, that the changes in the sun's altitude are then 180 times more rapid than at the solstice, so that the exact time of the event may be more readily detected. These experiments have led the author to a very plausible and interesting theory concerning the object of the great pyramids of Egypt. These are located upon the 30th parallel of latitude, their base is square and aligned with the four points of the compass, while the angle of the slope is such that at the vernal equinox the Great Pyramid consumes its own shadow at noon; the sun shining down upon the north slope so as to illumine its entire base. Originally a graduated pavement extended north of the pyramid 268 ft. the length to which its shadow would be cast at the winter solstice. By observing the shadow upon this pavement the gradual elevation of the sun toward the vernal equinox could be noted with increasing accuracy up to the day when it finally crossed the line.

According to our author the remarkable geometrical proportions of the Great Pyramid result from the fact that it is built upon the 30th parallel, that is, ⅓ of the distance from the equator to the pole. This determined the slope of the sides, and the size of the base proportionate



REMNANT OF THE ORIGINAL CASING STONE SURFACE OF THE GREAT PYRAMID.
NEAR THE MIDDLE OF ITS NORTHERN FOOT AS DISCOVERED BY THE EXCAVATIONS OF COL HOWARD VYSE IN 1837

EXAMPLE OF THE CASING-STONES OF A PYRAMID, SUPER-POSED
ON THE RECT-ANGULAR MASONRY COURSES: FROM A PHOTOGRAPH BY P.S. OF THE SUMMIT OF THE 2ND PYR

Reproduced by the courtesy of M. B. Cotsworth from "The Rational Almanac."

to the height. Among these geometrical coincidences are: 1st, that the vertical height of the pyramid applied as a radius to describe a circle produces a circumference exactly equal in length to the sum of the 4 square base lines, that is, it solves the celebrated problem of squaring the circle. 2d. The area of the vertical central section parallel with the base lines is to the area of the base as the diameter of a circle is to its circumference. 3d. The vertical height is to the sum of any two sides of the base as the diameter of a circle is to its circumference, giving the ratio of 1 : 3.14159. It certainly is a very important point to have found that these remarkable geometrical coincidences are the result of a natural cause rather than the product of supernatural wisdom, as some have supposed, or of almost incredible attainments in mathematical knowledge as others have thought.

But this perfection of arrangement for serving the purpose of a sun-dial was not attained at once. Our author shows, by careful study of numerous other pyramids erected in Egypt, that they were experiments and partial failures until the Great Pyramid was erected. Most of them were some distance from the true parallel for best observation, while others were not built with sufficient accuracy of outline.

But why all this protracted and enormous effort to erect a sun-dial that should enable them to determine the length of the year with great accuracy? The answer is to be found in the enormous importance of knowing the exact day upon which to sow and plant different seeds in Egypt. If the calendar were allowed to slip forward, as it would if leap year were not observed, or backward as after centuries it actually did when too many leap years were observed, the whole succession of crops would be thrown into confusion and the production of the land diminished by ⅓ or ½. As a consequence famine and pestilence would follow and the whole national life be endangered. The Russian calendar is now 13 days behind the corrected Gregorian calendar. In view of these facts the labor expended in the erection of the pyramids is amply justified on utilitarian principles, and the work of the priestly class who carried on these experiments successfully to the end is seen to have been the most truly productive of any that was done.

But to our author the study of the monuments erected in ancient times to determine the altitude of the sun show that there has been since the erection of the Great Pyramid, a change in the latitude of 7.1°. The photographic proofs produced by the author show the critical shortest shadows of the Great Pyramid distinctly registered on the Meridian Rod at noon on March 2 and 3, when the sun now ranges 7.1° south of the equator, but as he produces conclusive astronomical evidence that the equinoctial slope was essentially the basis of the pyramid system of astronomical observation, it seems evident that when the pyramid was built, about 5,000 years ago, the noonday sun's shortest shadow then appeared on March 21, when the sun crossed the equator; therefore a definite change of 7.1° in latitude seems proved, especially as historic evidence proves beyond a doubt that the Egyptians and

Babylonians counted their years from the equinox, as the author states was inevitable, through the pyramid system of observation. Whereas the latitude of the pyramid is now 30°, at the time of its erection its latitude was 37.10° north, bringing Egypt into the climatic conditions of Spain, Sicily, Greece and Asia Minor. Estimating the Great Pyramid to be 5,000 years old, this would represent a shifting of the pole to the extent of 450 ft. annually, which is the amount independently observed by astronomers.

As all the roads led to Rome, so all studies, even that of the almanac, lead up to the Glacial period. It has been a favorite theory with many that the cause of the Glacial period was a shifting of the earth's axis to such an extent that the North Pole was at one time situated in southern Greenland. This movement of the Pole 450 ft. per year indicated by Mr. Cotsworth's studies, would have brought it into nearly this position at about the time usually assigned to the climax of the Glacial period. Such a coincidence is certainly a strong confirmation of the theory and deserves to be considered by all Glacial geologists in future speculations upon this interesting subject. Without giving unqualified acceptance to the theory, we are bound to say that the author's presentation of the complicated causes affecting the stability of the earth's axis of revolution goes far to remove the superficial objections to his theory, which would at first arise.

Nansen's demonstration of the existence of an open Polar Sea, or at least of a sea covered by only a thin coating of ice, brings into strong relief the great disturbances to the symmetry of the earth's sphere, which was produced by the accumulation of glacial ice over the northeastern part of Europe and the northern part of North America. Upon 6,000,000 square miles of territory the ice accumulated to a depth of a mile or more, thus adding to that segment of the earth's sphere a weight which is greater than that of the entire continents of Asia and North America, and abstracting an equal amount from the oceans. With such tremendous forces known to be in operation great liberty is certainly allowed for speculation, and all geologists will welcome whatever light the study of the growth of the almanac may shed upon the obscure and intricate problem of the cause and date of the Glacial period.

Coming to more practical affairs we find in the almanac of the present time a startling record of the abuses which have crept into the calendar through the ignorance of the past ages. Few can realize (until their attention is called to it) how inconvenient is our present calendar. Our author is a well-known railway authority, author of Maximum Railway Rates, the standard book on the subject) and one of the most distinguished mathematical experts of England, and has consequently been brought face to face in a very practical manner with the disadvantages of our present calendar, arising from the irregular occurrence of week days on successive years, and of the irregular length of months. These disadvantages he summarizes as follows:

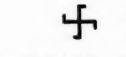
1. Days of the week on different dates during succeeding years.
2. Weeks not comparative year by year.
3. Impracticable now to get the much needed monthly balances of income and expenditure for large businesses, etc., etc.
4. Months irregular, thereby involving broken weeks, which cause injustice in monthly payments and in face of weekly wages, etc., etc., making monthly balances almost impracticable.
5. Business, parliament, law courts, university, college, school, etc., terms disturbed and unequal.
6. Quarters, half-years, etc., uneven for interest, rents, etc., involving odd days of weeks to adjust, thus giving needless trouble and risk of error.
7. Disturbance of quarter days, etc., when falling on Sunday.
8. Unreliable comparison of revenue, expenditure, railway, and all business, etc., earnings, owing to variations of Easter and the unequal length of months.
9. Periods of earning disagree with periods of payment, producing inequalities in earning time.
10. Wastes time, money, and energy, creates worry, causes undue suffering to the poor, tends to make mistakes in dates.
11. Easter, Whitsuntide and other festival holidays, etc., vary with the moon.
12. Public holidays liable to fall on very inconvenient days and dates.
13. Leap-year-day badly fixed and an injustice to salaried persons; impedes just pension schemes; irksome and anomalous.

A formidable list surely, but one which can be fully appreciated only by men experienced in corporation accounts. For his detailed discussion of these evils the reader must consult the book itself.

The main step suggested towards Almanac Reform is to designate Christmas Day apart from any week day name and fix it to follow the last Sunday in the year, to permanently extend that great holiday by insuring the week-end advantages, and at the same time get rid of the odd-week-day, which now changes the week-day names for dates through successive years. That would be a great advantage to everybody, and should be applied for public convenience. In order to bring this change about with as little inconvenience as possible the author would have the reform begin in 1916, when New Year's day will occur on Sunday and with his adjustment would continue to do so ever afterwards.

But in such brief space we can give only a faint idea of the interest which our author imparts to the subject, and of the immense amount of curious and instructive information which he has collected in this volume. Everyone should read it for himself.

G. F. W.



QUATERNARY MAN IN CALIFORNIA:—Among the definite results of the work of the Department of Anthropology of the University of California, is the probable establishment of the fact that man was living in California at least as early as middle-quaternary times.

WASHINGTON AND THE WEST*

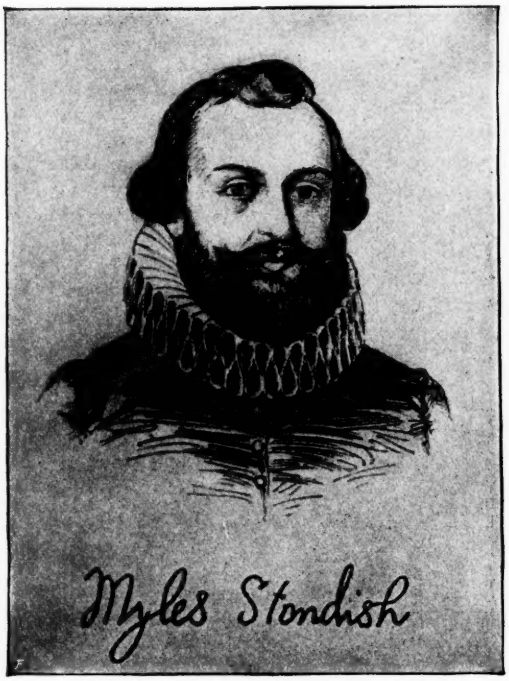
BY making Washington's diary of 1784 accessible to the public, Mr. Archer B. Hulbert has brought out a phase of that great general's life and his ambitions which has heretofore passed almost unnoticed. His interest in the development of the West originated, when as a young man in 1748 he was surveying on the upper Potomac. Later, "in 1753 he was sent to the French forts near Lake Erie as envoy extraordinary from the Governor of Virginia; in 1754 he commanded the Virginia Regiment which formally opened the Old French War at Fort Necessity; in 1755 he marched with Bulldog Braddock to the death-trap beside the Monongahela, and in 1758 he led the Virginia Vanguard of General John Forbes' army to the capture of Fort Duquesne. Here Washington learned his few lessons in war—and it is prophetic that he should have learned them west of the Alleghanies. For, no sooner was the French War over, than the young Colonel, now settled at Mt. Vernon, turned instantly to the West as a richly promising field for commercial exploitation."

The diary covers his trip in 1784 from Mount Vernon to western Pennsylvania and return, which took from September 1 to October 4. Although during his trip he looked after such of his property as was in Virginia and Pennsylvania, yet the broader interests of the country were uppermost in his mind. He foresaw the great possibilities of the Ohio Valley and the probability that its commerce woud go down the Ohio and Mississippi unless communication, of course by water, could be established between the Ohio Valley and the Potomac.

The efforts of Mr. Rumsey to construct a boat for river navigation, which could be propelled against the current by mechanical means, specially interested Washington, for it seemed to solve the difficulties of interstate water communication, which seemed to him of paramount importance.

Following the diary, Mr. Hulbert gives an interesting "commentary" on it which is especially suggestive, as he has recently gone over the same route himself. Maps of Braddock's Road, Washington County, at the time of Washington's tour, and Washington's own map of the country between the Potomac and the Youghiogheny add to the intrinsic value of the book.

**Washington and the West*, with commentary by Archer Butler Hulbert, author of *Historic Highways of America*. With four maps, and half-tone of Washington's Mill, from photograph. Octavo, 300 pages. Printed on buff paper. Price, $2.00 net: postage, 12 cents. New York: The Century Co.



CAPTAIN MYLES STANDISH

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CAPTAIN MYLES STANDISH*

TO the average American, Capt. Myles Standish is known only through Longfellow's poem, which although intensely interesting, is also very misleading, not only as to Myles Standish, but also to the general conditions in the colony at Plymouth. For this reason it is important to have such a history of Captain Standish as that prepared by Mr. Tudor Jenks. It forms a companion book to that on Captain John Smith, of the more southern colony, by the same author.

Mr. Jenks can add nothing to the early history of Captain Standish, probably this will always remain a blank page, but he tells his history from the time the Mayflower landed until his death in a very readable and delightfully simple style, drawing special attention to the everyday work of building and planting and even the housework. For at one time during the first winter at Plymouth there were but seven men capable of work, and these seven "tended the sick, washed the clothing, and made themselves men-of-all-work for the whole settlement."

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* *Captain Myles Standish*, by Tudor Jenks. Illustrated; 12mo.; 259 pages. Price, $1.20 net; postage, 11 cents. New York: The Century Co..

Concerning the misconception which has arisen from Longfellow's *Courtship of Myles Standish,* and James Russell Lowell's *An Interview with Miles Standish,* he says, "It is not to be too critical to make objection to these poems. They foster wrong ideas of the colonial leaders, and cause us to underrate them, and they are read by thousands who never give an hour to serious study of the authentic records where alone is to be found the truth about such notable men as the old Puritan captain, Myles Standish. Yet these men have a right to be truthfully represented to their posterity, and not caricatured in unfounded and misleading fables."

EDITORIAL NOTES

AN ANCIENT EGYPTIAN LAWSUIT:—The subject of the text, *The Inscription of Mes,* translated by Alan H. Gardiner, is a lawsuit, in which one Mes succeeded in establishing, on appeal, his title to lands of which he had been deprived at a former trial by forged evidence and the falsification of official registers.

It is amusing to note that while the male witnesses in the "Great Qenbet," which appears to have been a court presided over by the chancellor or vizier in person, swear under the penalty of becoming "slaves in Kush," *i. e.,* Ethiopia, the women imprecate that if perjured, they may be "sent to the back of the house"—that is, may become servants where they are now mistresses. A reference to Khuenaten as "the enemy of El Amarna" is also noticeable.

THE CALAVERAS SKULL:—Studies of the Calaveras skull, undertaken by Professor Putnam, Professor Merriam, and Mr. Sinclair, have shown that there is probably an error in relation to the historical skull which has been handed down as the one taken from the Matason shaft, and from the evidence secured it appears that by some mischance the skull taken from the shaft has been lost. The matrix in and around the skull is unlike that of the auriferous gravels and is in every respect of the same character as that in the limestone caves of Calaveras County and vicinity, and the associated organic remains are also characteristic of caves. The skull itself is partly covered with a thin calcareous incrustation, such as is commonly found on remains in the caves. There is thus a high degree of probability that the skull came from one of the Calaveras limestone caves, and afterwards, through confusion, owing to the hands it passed through, was believed to be the skull taken from the Matason shaft. As yet little can be said concerning the age of this far-famed specimen, though it does not appear to be very recent. A thorough exploration of the Calaveras caves is very desirable in this connection.

AFFINITIES OF THE YUKAGHIR:—Mr. Waldemar Jochelson, in an essay on *The Grammar of the Yukaghir Language,* notes the following morphological peculiarities:

Word-formation is accomplished mainly by means of suffixes; but prefixes are also used (almost exclusively in connection with verbal forms). In this respect the language differs from those of the Ural-Altaic group, which use suffixes only, and approaches the American language.

The possessive suffixes of nouns is but little developed (except in the third person); the language thus differing from the Ural-Altaic, as well as from the Eskimo dialects.

The difference in the conjugation of transitive and intransitive verbs which we have in the Yukaghir language is a feature common to almost all American languages. The same may be said of the capacity of bases of transitive verbs to change into intransitive by means of suffixes, and *vice versa.*

There is no difference between animate and inanimate objects, as is the case in some Indian dialects.

The feature known as "polysynthesis" in American dialects, and which consists of a combination of two or more uninflected bases in a word, in which one of the bases expresses the principal idea, and is put at the end of the word, while the other bases figure as secondary definite ideas, is also to be met with in the Yukaghir language.

YUKAGHIR BURIAL CUSTOM:—The following is a free translation, by Mr. Jochelson, of an ancient burial custom as told by an old Yukaghir man living on the Korkodon River in northeastern Siberia:

Our ancient people, when a shaman died, used to separate the flesh of the corpse from the bones. For that purpose they put on gloves and masks. Then they took iron hooks, and having caught the flesh of the corpse, drew it to them and cut it off. It was considered a sin to touch the corpse with the bare hands or to look at it with uncovered face. Thus they separated the flesh from the skeleton on its entire length. Then they made drying frames and hung the flesh on them outside in the sun to dry. After the flesh was dried, the relatives of the dead shaman divided it among themselves. Having then made a tent of thin larch trees, each of them put his share in the middle of the larch tent separately. Then the relatives of the shaman killed dogs as offerings. They did not kill bad dogs; they killed only good ones. Then they added the killed dogs to their portion of dried flesh. After that they left the tent with the shaman's flesh and the dog offerings.

Then they divided the bones of the corpse, and, after having dried them, they clothed them. They worshiped the skull of the shaman. They made a trunk of wood, and set on it a skull. Then they made for it (for the idol) a jacket and caps (two caps—a winter and summer one). They embroidered the coat all over. For its face they made a mask, with openings for eyes and mouth. Over the embroidered coat they put a coat of faun skins, and over that a blanket of soft reindeer skin.

Then they placed the figure in the front corner of the house. Whenever they were going to eat something good, they first threw a piece of it into the fire, and held the figure over the smoke. This they did at every meal; and thus they fed the figure, which was worshiped like a god.